

Zero Retries issue 0076 2022-12-09

Zero Retries is an independent newsletter about technological innovation in Amateur Radio.

About Zero Retries

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Request To Send

Well, *that* was fun. When I decided to wade into Mastodon, you have to choose a specific Mastodon server. I chose mastodon.radio as it was the only one I'd heard about (at the time I made the decision) where other Amateur Radio Operators were clustering. Once I was minimally operational there, several folks (and the *system*) encouraged me to migrate my account (n8gnj@mastodon.radio) to mastodon.hams.social, because mastodon.radio is a server in the UK, and mastodon.hams.social is a server in the US. I've experienced notable latency using mastodon.radio so I tried "the procedure" to migrate my account from mastodon.radio to mastodon.hams.social. Each attempt resulted in an error message like *something doesn't seem right*.

I could have started over, deleted n8gnj@mastodon.radio, and restarted, but a number of folks were already following, and I was following them, and there was some momentum, and this was intended as a learning experience, so...

I gave up on migrating to mastodon.hams.social, deleted my account there to reduce the confusion of two n8gnj's on Mastodon, and will stay put on mastodon.radio. This wasn't a bad experience as such things go, at least for me. Others have [apparently had worse experiences](#).

ARDC

It's become necessary to clarify that I now have *no* involvement (formal, informal, casual, etc.) with Amateur Radio Digital Communications (ARDC). I'm now just a member of the public, following what information ARDC chooses to make public. Anything I write about ARDC from now on *can* only be from public information. This formal statement is necessary because I want to write about, and dive deeper, into a number of projects that ARDC has funded with grants. ARDC (to clarify, one key ARDC staff member) felt that doing so was inappropriate if I continued to have *any* involvement with ARDC.

When I was a member of the ARDC Grants Advisory Committee (GAC), that condition was reasonable and understandable, but my involvement with the GAC ended last week, and I no longer have any influence on grant proposals to ARDC. As I've highlighted in a number of articles and numerous mentions here in Zero Retries, ARDC grants can be transformative, enabling numerous technologically innovative projects in Amateur Radio. Now freed of the constraints of involvement with ARDC, I'm now looking forward to interviewing many [ARDC grant recipients](#) and discussing their projects in depth from the unique Zero Retries perspective.

As I try to discuss every week here in Zero Retries, there is a *lot* of technological innovation... and a lot of good and interesting ideas emerging in Amateur Radio in the 2020s. But, as I discussed in Zero Retries 0000, a lot of good, even great ideas just... fizzle out. Sometimes, what makes the difference between a good / great idea and a widely adopted project is, simply, *funding*, including funding salaries to allow focused, dedicated development time to get the project to a point where it's sustainable and usable by others. ARDC grants are now enabling some good / great ideas to become more than just experiments and prototypes. Thus I wish ARDC, its staff, board, and volunteers well in its continuing missions of providing grants and maintaining and growing 44Net. 2023 will be another interesting and exciting year for ARDC and I look forward to writing about what they're doing and the projects their grant funding enables.

de Steve N8GNJ

Austin Mesh - Non Amateur Radio (LoRa) Wide Area Chat Network

Technological Innovation in amateur (as in non-professional) radio technology isn't limited to Amateur Radio. Several people pointed out this interesting project.

[Austin Mesh](#) is a community group working to build a mesh network of solar-powered [meshtastic](#) radios in Austin. This network acts like a city-wide text messaging system. This allows people to send unencrypted group text messages to everyone on the network. Users can also send encrypted messages to any specific member. All of this happens without any external infrastructure - no power, no cell phone towers, no internet.

How does it work?

We have set up a number of solar-powered radio repeaters in Austin. These radios communicate at [900 MHZ](#) using the [LoRa protocol](#). The radios mesh using the open-source software [meshtastic](#).

Can you explain it like I'm 5?

Pretend you're sitting in class and want to send a note to everyone in the class. You write your note on a piece of paper and copy it three times. The message can be up to 228 characters - about as long as this paragraph so far. You hand those three pieces of paper to the three people around you. Then those three people re-write the message three times and hand it to the three people around them and so on. Now imagine a big gust of wind comes and blows away some of the messages. If even just a few people saw the note and keep copying and re-sending it, eventually everyone will get a copy of the note. Austin Mesh works the same way but instead of paper notes we're using digital text messages and sending it with radios. Our radios are solar powered and they don't need any internet or cell phone coverage. This means they will work even if the power is out.

Wait so it's just like a big group text message chain?

Yep.

I suspect that this project will get replicated in a number of areas, especially given that it's license-exempt and uses the robust LoRa technology. Portland, Oregon and Seattle, Washington attempted amateur (as in not done professionally) community wireless networks based on Wi-Fi, but those projects failed because of... well, Wi-Fi. This approach will probably fare better.

I'll be adding this project to my growing list of things to maybe, think about, perhaps, attempting to do in N8GNJ Labs. Subject, of course, to "The Power of No" discussed here last week.

Ham Radio Outlet Catalog Fall / Winter 2022

Being old, I enjoy print media (for as long as it lasts) and at the moment [Ham Radio Outlet](#) indulges folks like me by publishing an old school catalog. Within a few days of the arrival of the [HRO catalog](#), I spend a few minutes browsing it cover to cover. This time, I browsed it in my office with a keyboard nearby, so here's what I found "Zero Retries Interesting" in this edition :

- Page 4 - **Alinco - DR-135TMKIII** and **DR-06TA** - these radios have a "flat audio" interface for higher speed data modes.
- Page 10 - **Icom - IC-9700** - it continues the D-Star "Digital Data" (DD) mode for 128 kbps on 1240-1300 MHz.
- Page 11 - **Icom - IC-905** (not shipping) - the VHF / UHF / Microwave super-radio formally announced in late 2022.

- Page 14 - **SDRplay** - **RSP1A**, **RSPdx**, and **SDRduo** - all great Software Defined receivers.
- Page 20 - **Yaesu** - **FTM-6000R** - this new (introduced this year) radio model has a “flat audio” interface for higher speed data modes.
- Page 28 - **Farallon Electronics / SCS** - **DR-7400** and **DR-7800** PACTOR-4 modems - love PACTOR-4 or hate it, its about the fastest data mode on HF.
- Page 29 - **Kantronics** - **KAM XL**, **KPC-3 Plus 512K USB**, and **9612XE USB** TNCs - the staying power of Kantronics is certainly impressive.
- Page 29 - **Microsat** - **APRS Voyager** - an APRS radio with Bluetooth interface.
- Page 29 - **Microsat** - **WX3in1 Mini** - APRS interface, plus KISS and weather station support.
- Page 30 - **West Mount Radio** - **RIGblaster** audio interfaces.
- Page 32 - **MFJ** - “**Digital Mode Devices**” - **TNC-X** and the **MFJ-1270PI**. The TNC-X is a licensed and “MFJ-ized” version of the [Coastal ChipWorks TNC-X](#) and the MFJ-1270PI is similarly a licensed and “MFJ-ized” version of the Coastal [ChipWorks TNC-Pi](#). The MFJ-1205 is a typical audio interface.
- Page 33 - **Timewave Technology** - **PK-232SC** and the **Navigator** audio interface.
- Page 34 - **Tigertronics** - **Signalink USB** - While the Signalink USB is yet another audio interface, it is the best-supported, and I’d guess best selling audio interface. If I don’t have a reason to use a high performance audio interface, my default is the Signalink USB.
- Page 77 - **Samlex America** - **SEC-1223BBM** - a 23 amp 12 volt power supply with an integrated battery charger / failover to battery capability. Just attach a battery to it and if power fails, the unit switches over to the battery - basically a 12 volt DC Uninterruptible Power Supply. This is a more integrated approach than my previous favorite approach to this capability, the West Mountain Radio Super PWRgate PG40s.
- Page 78 - **Bioenno Power** - **Lithium Iron Phosphate Batteries** - I have no personal experience with these batteries, but folks I trust say great things about them for their power / weight ratio, and their overall usable life. For my next power project that requires batteries, I’ll probably invest in one of these units.
- Page 79 - **CoaxWrap** is self-fusing silicone tape for weatherizing coaxial cable connectors on (exterior mounted) antennas. Self-fusing silicone tape is far, far superior to Coax-Seal. If you need to change the connector or whatever, CoaxWrap is easy to cut off; in comparison Coax-Seal is (in my experience) is nearly impossible to completely remove cleanly. (There’s nothing unique, that I can see, about CoaxWrap versus other silicone self-fusing tape... it’s just that HRO stocks it, I’ve had good experience using that brand, and whenever I order a new antenna or coax, I order a roll of CoaxWrap.)

- Page 103 - **Diamond Antenna - multi-band base station antennas.**

Page 108 - **Comet - multi-band base station antennas.**

As much as I love experimenting with radios, antenna work, to me is a necessary evil (despite antennas generally being the most important component of a radio / feedline / antenna system). Thus when I have to do antenna work, I want to do it once and forget about it as much as possible, and in my experience, Diamond Antenna and Comet units hold up in outdoor service. I happily pay the premium for multi-band antennas - more bang for your “antenna pain” buck.

Open Source Passive Radar Capability Removed from KrakenSDR Code

[OPEN-SOURCE PASSIVE RADAR TAKEN DOWN FOR REGULATORY REASONS](#) -

Good article by Arya Voronova on Hackaday giving an overview of the KrakenSDR and the concept of “passive RADAR”. I was a bit skeptical that it really was the case that the “simple” (but elegant) idea of a KrakenSDR - essentially five inexpensive software defined receivers fed by the same time base and USB hub with open source software could actually run afoul of International Traffic in Arms Regulations (ITAR) rules. But, yep - I agree with Voronova - it’s right there - [Category XI - Military Electronics](#):

(xxvii) Bi-static/multi-static radar that exploits greater than 125 kHz bandwidth and is lower than 2 GHz center frequency to passively detect or track using radio frequency (RF) transmissions (e.g., commercial radio, television stations);

We’ve been here before. Robust encryption using the (initially, disruptive) computing power of personal computers used to be ITAR controlled until encryption became so pervasive that attempting to control it became a useless exercise. (There were also legal cases that pushed back against government’s attempt to neuter or prohibit strong encryption.)

You might think this particular restriction is silly... and on the face of that argument, you’d be right. Simple passive RADAR only works when you have powerful transmitters in known locations transmitting continuously - broadcast radio, broadcast television, etc. In a war zone, it’s easy to shut down passive RADAR - kill the transmitters with missiles or artillery fire.

But, silly or not, running afoul of ITAR *is* very serious. Despite KrakenSDR being a “hobby” project, the full weight of the US government *can* come down on you if there’s even a possibility of an ITAR violation... *and has*. It’s not widely known, but there were some pro forma ITAR violations on some Amateur Radio satellite projects, and one person that was affected told me that very serious penalties were *credibly* threatened by the US government. Thus, I don’t blame the KrakenSDR developers for being super cautious about ITAR.

Keep in mind that (as I inexpertly understand it), ITAR doesn’t say “can’t *use* it / can’t *experiment* with it - it just says “can’t *export* it”... whatever “export” means these days regarding open source software and hardware that’s posted on the Internet. So, now a “hobby” technology such as the KrakenSDR ([it’s only \\$399](#)) is something that the full force of national governments are going to attempt to control. In the end, they’ll fail to effectively restrict this technology. Anyone with funds can get software defined receivers by the *pallet*, and if the KrakenSDR creators were able to figure out passive RADAR using such a system... well, the

US doesn't have a monopoly on smart engineers familiar with software defined radio technology.

Yes, I know there are many other examples of “ordinary” technology that's ITAR restricted. You can't ~~build~~ sell a GPS receiver that operates above certain ground speeds, or altitudes. Some processors are restricted by ITAR. Etc. In this, KrakenSDR isn't unique, it just happens to be Zero Retries Interesting, thus worth discussing here.

Mercury - a Configurable Open Source Software Defined Modem

Disclaimer - I attended a presentation that some of the Rhizomatica developers gave to ARDC. Apparently that presentation was “privileged information”, not to be discussed outside ARDC. None of what I discuss below references information disclosed in that presentation that hasn't also been publicly disclosed by Rhizomatica or ARDC.

Rhizomatica [recently released](#) their source code for their [Hermes system](#) as a working telecommunications system that uses (non Amateur Radio) HF as its backbone. Abstract from the Hermes repository:

The software-defined modem features an Orthogonal Frequency-Division Multiplexing (OFDM) modulator/demodulator with a Low-Density Parity-Check (LDPC) error correction code encoder/decoder with an embedded Additive white Gaussian noise (AWGN) channel simulator.

I mentioned Rhizomatica in Zero Retries 0074, and instead of re-explaining it, I'll just reprint it here to provide some context.

...

ARDC - Rhizomatica: Connecting the Unconnected

Great article by Dan Romanchik KB6NU of ARDC about one [2021 ARDC grant](#) to develop a (non Amateur Radio) system for very remote areas that use HF radio links. I was on the 2021 ARDC Grants Advisory Committee (GAC) and reviewed this grant proposal (very favorably). Thus I was aware that a goal of this grant, as stated in their grant proposal, was to develop an open source replacement for VARA HF. That's a big deal as VARA HF is the most robust, highest speed data mode on HF (that I'm aware of, other than hardware modem, and expensive, Pactor 4). Because that goal wasn't explicitly stated in the public disclosures of this grant, and the confidentiality agreement required of GAC members, I couldn't mention that work. But KB6NU, as ARDC's Communications Manager, can disclose such info, so now it can be told! Here's the money quote, and the big win for why ARDC's grants can be transformative:

In addition to making this immediate impact, Rhizomatica is working on projects that they feel will make an impact in the future. One of these projects is an open-source replacement for VARA HF, a high-performance HF modem based on OFDM modulation. They are also working on improving Codec2, an open source speech codec designed for communications quality speech at low bit rates, and are experimenting with using artificial intelligence techniques to develop error correction codes.

...

One primary element of the Hermes system is [Mercury](#), a configurable open source software defined modem for radio communications. Per the mention in the ARDC story, Rhizomatica wanted to replace VARA HF with an open source equivalent, so Mercury, like VARA HF is only a transport mechanism. While the release of Mercury code is an exciting development, it's not packaged for easy "download and run on <your operating system of choice>"; it will take some time to adapt Mercury for use on Amateur Radio, especially given that the Hermes system was designed for use on HF and a radio that is designed-for-purpose - not Amateur Radio.

One of the most exciting elements of Hermes is its use of [Unix-to-Unix Copy \(UUCP\)](#) protocol, explained in Section 2.2 of the [Hermes User Manual - July 28, 2022](#).

All data exchange in the HERMES system is done through UUCP. Being an asynchronous protocol, all the data is first queued before being transmitted. The elements of the UUCP queue are called "jobs", and each job in the HERMES system can be an e-mail, a public message, or special remote command execution message (for example, to inform of a new e-mail user creation).

UUCP is a versatile file transport mechanism that can be highly asynchronous and does not depend on continuous connectivity such as TCP/IP. Thus it is (in my opinion) a great fit for sporadic connectivity such as Amateur Radio. Connect when you can, exchange UUCP data, and then go back offline.

Another exciting feature of Hermes is the built-in channel simulator. That allows testing of various modem features over a variety of simulated channel conditions.

Now that Rhizomatica has released their code as open source, it will require a community to form to adapt it to the unique requirements of Amateur Radio. This is a *great* start on more capable open source software modems with more sophisticated technology such as OFDM.

ZR > BEACON

- **Digital Library of Amateur Radio & Communications Followup**

If you haven't been following the Internet Archive project [Digital Library of Amateur Radio & Communications](#), some really interesting stuff is starting to appear there, including some of my donated material. The concerns I had about donations to DLARC suffering from the Internet Archive "warehouse effect" (donations get shunted to "warehouse limbo" to be digitized at some indefinite future date) are now alleviated. In December I'll be busy emptying many more pounds of paper from my Amateur Radio archives here at N8GNJ Labs and shipping them off to DLARC.

DLARC still has the maddening presentation interface - in a physical bookstore it would be as if material had been shelved randomly wherever there was an open space on a shelf, with no way to actually find something specific unless you know exactly what the title is for the search tool. Even then, using the search function is frustrating. One example is typing in "TAPR" gets a lot of videos and DCC Proceedings, but not the book [Wireless](#)

[Digital Communications: Design and Theory](#) by Tom McDermott N5EG which is published by TAPR. Oh well... I'm told it will get better at some point and the priority of the moment is acquire now, develop usable index later.

- As discussed in Zero Retries 0065, the [Anytone BT-01 Mobile Bluetooth Speaker Mic for AT-D578UV Models with Bluetooth](#) seems to be shipping in small quantities. I received emails saying that one vendor had received fifteen (15) units, and another had receive twenty (20) units. My primary antenna is down for maintenance at the moment, so for these initial shipments, I'll pass on this \$150 unit.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out **Join the Fun on Amateur Radio** for some pointers.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with wireless technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- Pseudostaffers [Dan Romanchik KB6NU](#) and [Jeff Davis KE9V](#) for continuing to spot, and write about “Zero Retries Interesting” items on his blog that I don’t spot on my own.
- [Amateur Radio Weekly](#) consistently surfaces “Zero Retries Interesting” stories.
- The [Substack email publishing platform](#) makes Zero Retries possible. I recommend it for publishing newsletters.

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More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA

2022-12-09

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